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[illegible]

- Administration's Goods Movement Action Plan
- Community health and environmental justice
- ARB's Diesel Risk Reduction Plan
- Air quality standards and plans (SIPs)

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- Existing emissions impacts, especially near ports, rail yards, high traffic corridors
- Growth in international trade and goods movement in general
 - Goods movement contributes more than \$200 billion/year to California's economy
- "Legacy" fleets of diesel engines needing controls or replacement

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Key Steps of Health Impact Analysis

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graph TD; A[Air Quality Data] --> C[Total Exposure]; B[Emissions Estimates] --> C; C --> D[Baseline Incidence Rates & Response Functions]; D --> E[Health Impacts]; E --> F[Goods Movement Fraction]; F --> G[Economic Value]
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Key Steps of Methodology

Air Quality Data

Emissions Estimates

Total Exposure

Baseline Incidence Rates & Response Functions

Health Impacts

Goods Movement Fraction

Economic Value

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Air Pollutants Included

- Particulate matter (PM)
 - Diesel PM
 - Nitrates (NO_x) and sulfates* (SO_x) that form particles
- Ozone
 - From NO_x and reactive organics (ROG)

*Not yet included in goods movement analyses

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■ Methodology

- Developed and used by U.S. EPA
 - Benefit-to-cost ratio of Clean Air Act
 - Diesel regulatory impact analysis
- Used by ARB/OEHHA for State ambient air quality standards for PM and Ozone
- Used by ARB for diesel PM control measures and Goods Movement
- Endorsed by NAS, WHO, and others

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■ Sources of Information

- Substantial body of evidence
 - Scientific peer-reviewed journals
 - National and international studies
- ARB's 2002 PM standards review
- ARB's 2005 ozone standard review
- U.S. EPA's PM standard review

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■ Health Endpoints Considered

- Mortality (all-cause, cardiopulmonary, lung cancer, infant)
- Hospital admissions (pulmonary, COPD, pneumonia, asthma, cardiovascular, ER visits)
- Heart attacks
- Bronchitis (chronic and acute)
- Lower respiratory symptoms (asthma and others)
- Minor restricted activity days and work loss days
- School absences
- Low birth weight and pre-term birth
- Exacerbation of asthma
- Asthma attacks and asthma onset
- Decreased lung function growth
- Neurotoxicity, psychological factors (stress), and developmental effects
- Noise (including cardiovascular effects)
- Quality of life

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■ Health Endpoints Quantified

- Plan recognizes over 20 discrete health endpoints from PM and ozone exposure
- Staff sought sufficient evidence to quantify
- 8 outcomes now quantified, including some combined endpoints (all-cause mortality, asthma and respiratory effects)
- Remaining endpoints are addressed qualitatively

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■ PM and Premature Death

- American Cancer Society study (~500,000 adults, 1982-1998)
 - For PM_{2.5}, over 300,000 adults in 51 cities
 - Pope (2002) analysis
- Jerrett (2005) analysis for Los Angeles
 - About 23,000 adults
 - PM_{2.5} in 2000 from 23 monitors interpolated for each zip code

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■ Results

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2005 Health Impact: Quantified from Goods Movement

	Cases/Year
Premature death*	2,400
Hospital admissions (heart)	830
Hospital admissions (lung)	2,000
Acute bronchitis	5,100
Asthma/other respiratory symptoms	62,000
Work loss days	360,000
Minor restricted activity days	3.9 million
School absence days	1.1 million

*Uncertainty range is 720 to 4,100 deaths/year
(-1,200 premature deaths / $\mu\text{g PM}_{2.5}$)

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Scientific Peer Review

Prof. James Corbett (University of Delaware)
 Prof. John Froines (UC Los Angeles)
 Prof. Michael Jerrett (USC)
 Prof. Jane Hall (CSU Fullerton)
 Aaron Hallberg (Abt Associates, Inc.)
 Prof. Robert Harley (UC Berkeley)
 Prof. Michael Jerrett (USC)
 Dr. Melanie Marty (OEHHA)
 Dr. Bart Ostro (OEHHA)
 Prof. Costantinos Sioutas (USC)
 Prof. Akula Venkatram (UC Riverside)

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Conclusions

- Plan uses best available information on impacts of air pollution on health
- PM is the pollutant of greatest concern
- Goods movement accounts for a substantial fraction of the total health impacts

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■ Next Steps

- Public process to update PM-premature death relationship on-going
 - Develop best method to incorporate other PM studies into premature death analyses
 - New factor based on U.S. EPA's Expert Elicitation for PM
 - Draft ARB report December, followed by public and peer review
- Sulfate impacts to be based on SO_x Emission Control Area (SECA) analysis

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